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# FLOOD INSURANCE STUDY

## TOWN OF CLAVERACK, NEW YORK
## COLUMBIA COUNTY

SEPTEMBER 1980

Federal Emergency Management Agency

COMMUNITY NUMBER 360173

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program (NFIP) have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision (LOMR) process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial Flood Insurance Study Effective Date: September 6, 1989

Flood Insurance Study Revised:

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# 1.0 INTRODUCTION

## 1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Claverack, Columbia County, New York, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

## 1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by McCoy-Jackson Associates for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-84-C-1603. This work was completed in October 1987.

## 1.3 Coordination

In March 1987, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the town, and McCoy-Jackson (the study contractor) to explain the nature and purpose of the study, and to review the scope and limits of work. Information concerning the history of flooding in the study area was provided by town officials and residents, and the U. S. Geological Survey (USGS).

On September 6, 1989, a final CCO meeting was held with representatives of FEMA, the town, and the study contractor to review the results of the study.

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town Claverack, Columbia County, New York. The Village of Philmont is not included in this study. The area of study is shown on the Vicinity Map (Figure 1).

The following streams were studied by detailed methods: Agawamuck Creek, from its confluence with Claverack and North Creeks to the downstream corporate limits of the Village of Philmont; Claverack Creek (Lower Reach), from the downstream corporate limits to a point approximately 250 feet below the confluence of Taghkanic Creek; Claverack Creek (Upper Reach), from a point approximately 2,190 feet downstream of its confluence of Agawamuck and North Creeks to its confluence of Agawamuck and North Creeks; and North Creek, for its entire length within the community. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction through October 1992.

All or portions of the following streams were studied by approximate methods: Taghkanic Creek, Mud Creek, Claverack Creek, Agawamuck Creek, and several unnamed tributaries. Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Town of Claverack.

### 2.2 Community Description

The Town of Claverack is located in the center of Columbia County in southeastern New York State. It is bordered by the Towns of Ghent and Stockport to the north; the Town of Hillsdale to the east; the Towns of Livingston and Taghkanic to the south; and the Town of Greenport to the west. Claverack occupies an area of approximately 47.3 square miles. The 1980 population of the town was 6,061 (Reference 1).

Agawamuck Creek flows in a western direction to its confluence with North Creek at the Hamlet of Mellenville. It has an average slope of approximately 210 feet per mile and a drainage area of approximately 22 square miles at its confluence with Claverack Creek and North Creek.

Claverack Creek flows in a southeastern direction to its confluence with Taghkanic Creek, then flows north forming the corporate boundary with the Town of Greenport. Claverack Creek has an average slope of approximately 3 feet per mile and a drainage area of approximately 168 square miles at the downstream corporate limits.

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF CLAVERACK, NY**

**(COLUMBIA CO.)**

APPROXIMATE SCALE

4 0 4 8 12 MILES

**VICINITY MAP**

North Creek flows in a southern direction to its confluence with Agawamuck Creek. It has an average slope of 18 feet per mile and a drainage area of approximately 21.8 square miles at its confluence with Claverack Creek and Agawamuck Creek.

The climate of the region is characterized by moderately warm summers and cold winters. The mean July temperature is approximately 73 degrees Fahrenheit ($^{o}$F), while the mean January temperature is approximately 29$^{o}$F. The mean annual precipitation over the area is approximately 40 inches. Precipitation in the form of snowfall and sleet occurs mainly in the months of December through March with an average annual snowfall of approximately 43 inches (Reference 2).

### 2.3 Principal Flood Problems

Flooding can occur in the study area during all seasons, but generally the most notable floods have occurred between the months of February and April when snowmelt adds to heavy spring rains to produce increased runoff. Summer and fall floods also occur due to hurricane activity.

### 2.4 Flood Protection Measures

There are no structural flood protection measures located within the Town of Claverack.

Non-structural measures of flood protection are being utilized to aid in the prevention of future flood damage. These measures are in the form of land use regulations that control development within areas having a high risk of flooding.

## 3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is

approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

## 3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

The streams studied by detailed methods are large, rural, unregulated basins, with Claverack Creek being the only gaged stream. Due to large differences between the drainage areas of the studied streams and the gage on Claverack Creek, the gage was determined not to accurately reflect conditions for the remaining streams. For this reason, transposed gage flows were not used. Instead, a U. S. Army Corps of Engineers (COE) Regional Frequency Study was used to compute peak discharges along the streams studied in detail (Reference 3).

This analysis method used gage data throughout the upper Delaware and Hudson River basins to formulate regression equations. The parameters of drainage area, mean annual flood peak, standard deviation and skew are used in the regression equations. This analysis method was able to reproduce gage data and provided reasonable results throughout the study area (Reference 4). Therefore, this method was used to analyze all streams studied by detailed methods.

A summary of the drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

| FLOODING SOURCE AND LOCATION | DRAINAGE AREA (sq. miles) | PEAK DISCHARGES (cfs) 10-YEAR | 50-YEAR | 100-YEAR | 500-YEAR |
|---|---|---|---|---|---|
| AGAWAMUCK CREEK At confluence with Claverack Creek and North Creek | 22.0 | 1,280 | 2,650 | 3,510 | 6,460 |

TABLE 1 - SUMMARY OF DISCHARGES - continued

| FLOODING SOURCE AND LOCATION | DRAINAGE AREA (sq. miles) | PEAK DISCHARGES (cfs) 10-YEAR | 50-YEAR | 100-YEAR | 500-YEAR |
|---|---|---|---|---|---|
| CLAVERACK CREEK (Lower Reach) | | | | | |
| At downstream corporate limits | 168 | 6,570 | 12,200 | 15,400 | 25,900 |
| At confluence of Mud Creek | 156 | 6,210 | 11,500 | 14,600 | 24,500 |
| CLAVERACK CREEK (Upper Reach) | | | | | |
| At approximately 2,300 feet downstream of confluence with North Creek and Agawamuck Creek | 44.1 | 2,240 | 4,460 | 5,820 | 10,400 |
| NORTH CREEK | | | | | |
| At confluence with Claverack and Agawamuck Creek | 21.8 | 1,270 | 2,630 | 3,480 | 6,420 |

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections for the backwater analyses of the streams studied by detailed methods were obtained from aerial photographs at a scale of 1:9,600 (References 5 and 6). The below-water sections wee obtained by field measurement. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Water-surface elevations of floods of the selected recurrence intervals were computed using the COE HEC-2 step-backwater computer program (Reference 7). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. The starting water-surface elevations for Agawamuck Creek and North Creek were determined by using the coincident peak method. Starting water-surface elevations for Claverack Creek

(Lower Reach) were obtained from the Flood Insurance Study for the Town of Stockport (Reference 8). Starting water-surface elevations for Claverack Creek (Upper Reach) were determined by the slope/area method.

Channel roughness coefficients (Manning's "n") used in the hydraulic computations for the streams studied by detailed methods were chosen by engineering judgment and based on field observations of the streams and floodplain areas. The channel "n" values and overbank "n" values are shown in the following tabulation:

| Stream | Channel "n" | Overbank "n" |
|---|---|---|
| Agawamuck Creek | 0.030 | 0.080 |
| Claverack Creek (Lower Reach) | 0.030 | 0.050 - 0.100 |
| Claverack Creek (Upper Reach) | 0.030 | 0.070 - 0.080 |
| North Creek | 0.030 | 0.080 |

An "n" value of 0.015 was used for concrete structures and 0.024 was used for corrugated metal pipes. A weighted average "n" valued was used for bridges with steel decks, concrete abutments, and earthen bottoms. Noneffective flow areas were disregarded by using extremely high "n" values. The acceptability of all assumed hydraulic factors, cross sections and hydraulic structure data was checked by calibrating computed flood profiles to known historic flood profiles.

Water-surface elevations for the streams studied by approximate methods were determined by normal depth calculations.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

## 4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist in developing floodplain management measures.

## 4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4,800 with a contour interval of 4 feet (Reference 6).

For the streams studied by approximate methods, the 100-year flocd boundaries were delineated using topographic maps at a scale of 1:24,000 with a contour interval of 10 feet and the Flood Hazard Boundary Map for the Town of Claverack (References 9 and 10).

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

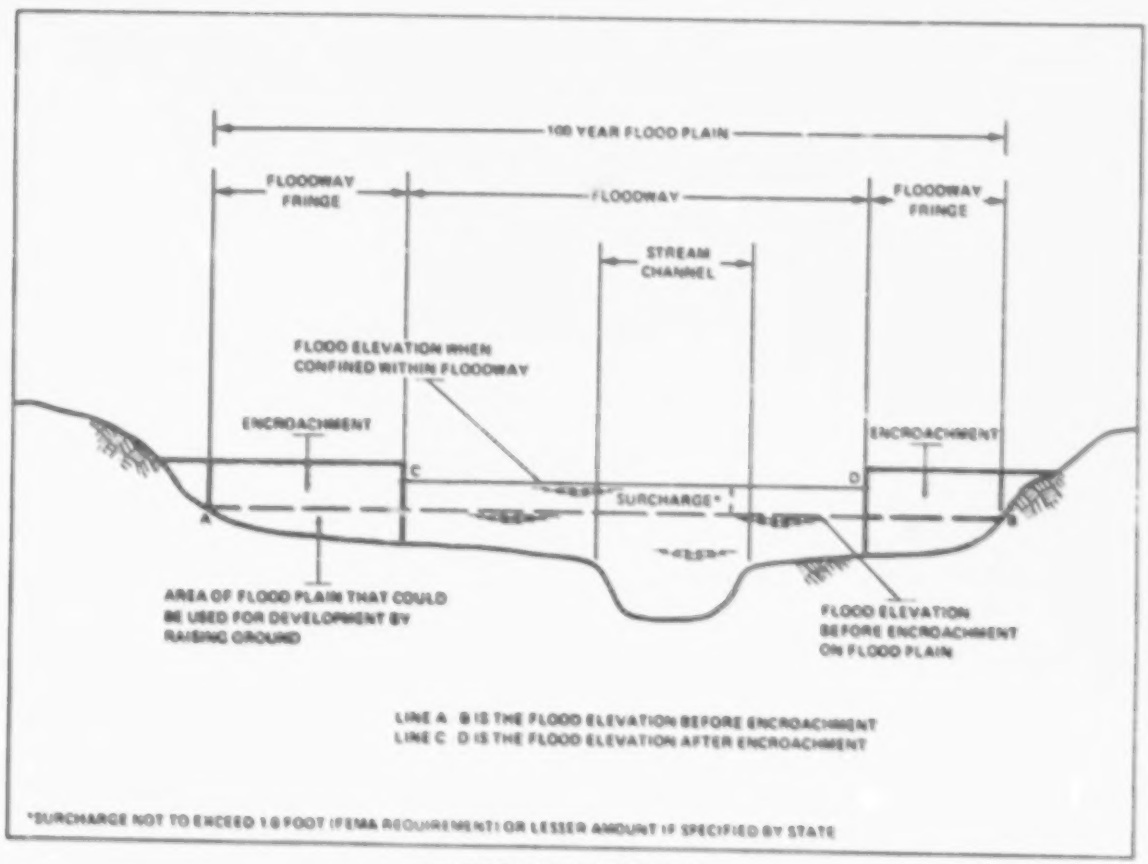
For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

## 4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as a minimum standard that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodways are shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown.

The area between the floodway and 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

**FLOODWAY SCHEMATIC** Figure 2

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY | WITHOUT FLOODWAY | WITH FLOODWAY | INCREASE |
| | | | | | (FEET NGVD) | | | |
| **Agawamuck Creek** | | | | | | | | |
| A | 400[1] | 159 | 763 | 4.6 | 240.8 | 240.8 | 241.8 | 1.0 |
| B | 1,200[1] | 63 | 318 | 11.0 | 244.5 | 244.5 | 244.5 | 0.0 |
| C | 2,000[1] | 60 | 403 | 8.7 | 251.2 | 251.2 | 252.1 | 0.9 |
| D | 2,880[1] | 43 | 316 | 11.1 | 279.2 | 279.2 | 279.2 | 0.0 |
| E | 3,100[1] | 87 | 955 | 3.7 | 299.5 | 299.5 | 300.2 | 0.7 |
| **Claverack Creek (Lower Reach)** | | | | | | | | |
| A | 1,200[2] | 128/60[3] | 2,005 | 7.7 | 121.9 | 121.9 | 122.7 | 0.8 |
| B | 3,400[2] | 124/50[3] | 1,746 | 8.8 | 123.6 | 123.6 | 124.5 | 0.9 |
| C | 5,000[2] | 481/370[3] | 4,792 | 3.2 | 126.2 | 126.2 | 127.1 | 0.9 |
| D | 7,400[2] | 518/230[3] | 5,526 | 2.8 | 127.1 | 127.1 | 128.1 | 1.0 |
| E | 10,200[2] | 647/600[3] | 5,954 | 2.6 | 128.0 | 128.0 | 129.0 | 1.0 |
| F | 12,600[2] | 631/535[3] | 7,303 | 2.1 | 128.8 | 128.8 | 129.7 | 0.9 |
| G | 14,200[2] | 717/660[3] | 6,832 | 2.3 | 129.6 | 129.6 | 130.6 | 1.0 |
| H | 16,600[2] | 346/560[3] | 13,074 | 1.2 | 130.6 | 130.6 | 131.5 | 0.9 |
| I | 18,800[2] | 518/420[3] | 13,882 | 1.1 | 130.9 | 130.9 | 131.8 | 0.9 |
| J | 21,500[2] | 1297/30[3] | 9,201 | 1.6 | 131.2 | 131.2 | 132.1 | 0.9 |
| K | 23,300[2] | 242/185[3] | 2,888 | 5.1 | 132.8 | 132.8 | 133.8 | 1.0 |
| L | 25,300[2] | 393/50[3] | 4,044 | 3.6 | 134.3 | 134.3 | 135.2 | 0.9 |
| M | 27,200[2] | 503/455[3] | 5,073 | 2.9 | 135.3 | 135.3 | 136.3 | 1.0 |
| N | 28,830[2] | 600/470[3] | 6,207 | 2.4 | 136.4 | 136.4 | 137.3 | 0.9 |
| O | 30,600[2] | 832/780[3] | 7,497 | 1.9 | 136.8 | 136.8 | 137.8 | 1.0 |

[1]Feet above confluence with Claverack and North Creeks
[2]Feet above corporate limits
[3]Width/width within corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF CLAVERACK, NY**
(COLUMBIA CO.)

**FLOODWAY DATA**

**AGAWAMUCK CREEK - CLAVERACK CREEK (LOWER REACH)**

| FLOODING SOURCE | | FLOODWAY | | | BASE FLOOD WATER SURFACE ELEVATION | | | |
|---|---|---|---|---|---|---|---|---|
| CROSS SECTION | DISTANCE | WIDTH (FEET) | SECTION AREA (SQUARE FEET) | MEAN VELOCITY (FEET PER SECOND) | REGULATORY | WITHOUT FLOODWAY | WITH FLOODWAY | INCREASE |
| | | | | | (FEET NGVD) | | | |
| **Claverack Creek (Upper Reach)** | | | | | | | | |
| A | 1,790[1] | 147 | 632 | 7.2 | 232.3 | 232.3 | 232.3 | 0.0 |
| B | 1,090[1] | 130 | 739 | 7.9 | 234.8 | 234.8 | 235.8 | 1.0 |
| C | 770[1] | 125 | 1,216 | 4.6 | 240.5 | 240.5 | 240.5 | 0.0 |
| D | 390[1] | 135 | 1,129 | 5.2 | 240.7 | 240.7 | 241.5 | 0.8 |
| **North Creek** | | | | | | | | |
| A | 600[2] | 266 | 1,740 | 2.0 | 242.7 | 242.7 | 243.6 | 0.9 |
| B | 1,600[2] | 247 | 811 | 4.3 | 243.8 | 243.8 | 244.6 | 0.8 |
| C | 2,500[2] | 176 | 639 | 5.4 | 249.4 | 249.4 | 249.7 | 0.3 |
| D | 3,400[2] | 91 | 549 | 6.3 | 252.8 | 252.8 | 253.3 | 0.5 |
| E | 4,200[2] | 130 | 749 | 4.6 | 254.2 | 254.2 | 255.1 | 0.9 |
| F | 5,000[2] | 137 | 924 | 3.8 | 256.5 | 256.5 | 257.2 | 0.7 |
| G | 5,900[2] | 135 | 756 | 4.6 | 257.8 | 257.8 | 258.8 | 1.0 |

[1]Feet below confluence of Agawamuck and North Creeks
[2]Feet above confluence with Claverack and Agawamuck Creeks

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF CLAVERACK, NY**

(COLUMBIA CO.)

**FLOODWAY DATA**

**CLAVERACK CREEK (UPPER REACH) - NORTH CREEK**

## 5.0 INSURANCE APPLICATIONS

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. The zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-depths derived from the detailed hydraulic analyses are shown within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 100-year floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 100-year coastal floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within the 500-year floodplain, and to areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

## 6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

## 7.0 OTHER STUDIES

Flood Insurance Studies have been prepared for Towns of Livingston and Stockport (References 11 and 8). The results of this study are in complete agreement with the results of those studies.

A Flood Insurance Study for the Town of Greenport is currently being prepared (Reference 12). The results of that study will be in complete agreement with the results of this study.

Due to its more detailed nature, this study supersedes the Flood Hazard Boundary Map for the Town of Claverack (Reference 10).

## 8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, 26 Federal Plaza, Room 1351, New York, New York 10278.

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9. U. S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 10 Feet: Claverack, New York, 1960, Photorevised 1980; Hillsdale, New York, 1953, Photorevised 1980; Hudson North, New York, 1953, Photorevised 1980; Hudson South, New York, 1963, Photorevised 1980; Stottville, New York, 1953, Photorevised 1980.

10. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Town of Claverack, Columbia County, New York, July 23, 1976.

11. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of Livingston, Columbia County, New York, Washington, D. C., May 11, 1979.

12. Federal Emergency Management Agency, Flood Insurance Study, Town of Greenport, Columbia County, New York (Unpublished).

Ven Te Chow, Open-Channel Hydraulics, New York, McGraw-Hill, 1959.

U. S. Department of Commerce, Weather Bureau, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, Washington, D. C., 1961, Revised 1963.

EXHIBIT 3 - ELEVATION REFERENCE MARKS

| Reference Mark | FIRM Panel | Elevation (Feet NGVD) | Description of Location |
|---|---|---|---|
| RM 1 | 01 | 141.10 | Large PK nail set 1.0 foot up pole No. NM 995 on west side of U. S. Route 9, located approximately 900 feet south of intersection of U. S. Route 9 and Pulcher Avenue. |
| RM 2 | 01 | 138.66 | Box culvert on top of concrete rail abutment on southwest corner of State Route 66 bridge over Claverack Creek. |
| RM 3 | 02 | 167.86 | Large PK nail 1.0 foot up pole No. NM 60 N.Y.T. #66, located approximately 100 feet south of intersection of State Route 66 and Humane Society Road. |
| RM 4 | 03 | 142.04 | X cut set on south end of east headwall of CONRAIL bridge over Claverack Creek. |
| RM 5 | 03 | 141.61 | Box cut on southeast corner of concrete bridge abutment on south headwall of bridge approximately 950 feet east of intersection of State Route 23B and County Route 29. |
| RM 6 | 03 | 137.39 | Box cut on centerline of concrete headwall on north side of Webb Road bridge over Claverack Creek, located approximately 300 feet east of intersection of Webb Road and County Route 29. |
| RM 7 | 08 | 322.39 | Box cut on northwest corner of concrete headwall of culvert on west side of County Route 9, located approximately 840 feet south of Town of Claverack corporate limits. |
| RM 8 | 08 | 274.61 | Large PK nail set 0.5 foot up pole No. T-464 on east side of County Route 9, approximately 0.3 mile north of intersection of County Route 9 and State Route 217 (Main Street). |

EXHIBIT 3 - ELEVATION REFERENCE MARKS - continued

| Reference Mark | FIRM Panel | Elevation (Feet NGVD) | Description of Location |
|---|---|---|---|
| RM 9 | 08 | 245.28 | X cut set on top rebar on east wingwall of north headwall of bridge located approximately 100 feet east of intersection of County Route 9 and State Route 217. |
| RM 10 | 08 | 295.08 | Box cut set on north end of east headwall of Roxbury Road bridge over Agawamuck Creek, located approximately 200 feet south of intersection of Roxbury Road and State Route 217. |

ELEVATION IN FEET (NGVD)

250

240

230

CONFLUENCE WITH CLAVERACK AND NORTH CREEKS

LEGEND

500 - YEAR FLOOD

100 - YEAR FLOOD

50 - YEAR FLOOD

10 - YEAR FLOOD

STREAM BED

CROSS SECTION LOCATION

0 1 2 3 4 5 6 7 8 9 10 11 12 13

STREAM DISTANCE IN HUNDREDS OF FEET ABOVE CONFLUENCE WITH CLAVERACK AND NORTH CREEKS

# FLOOD PROFILES

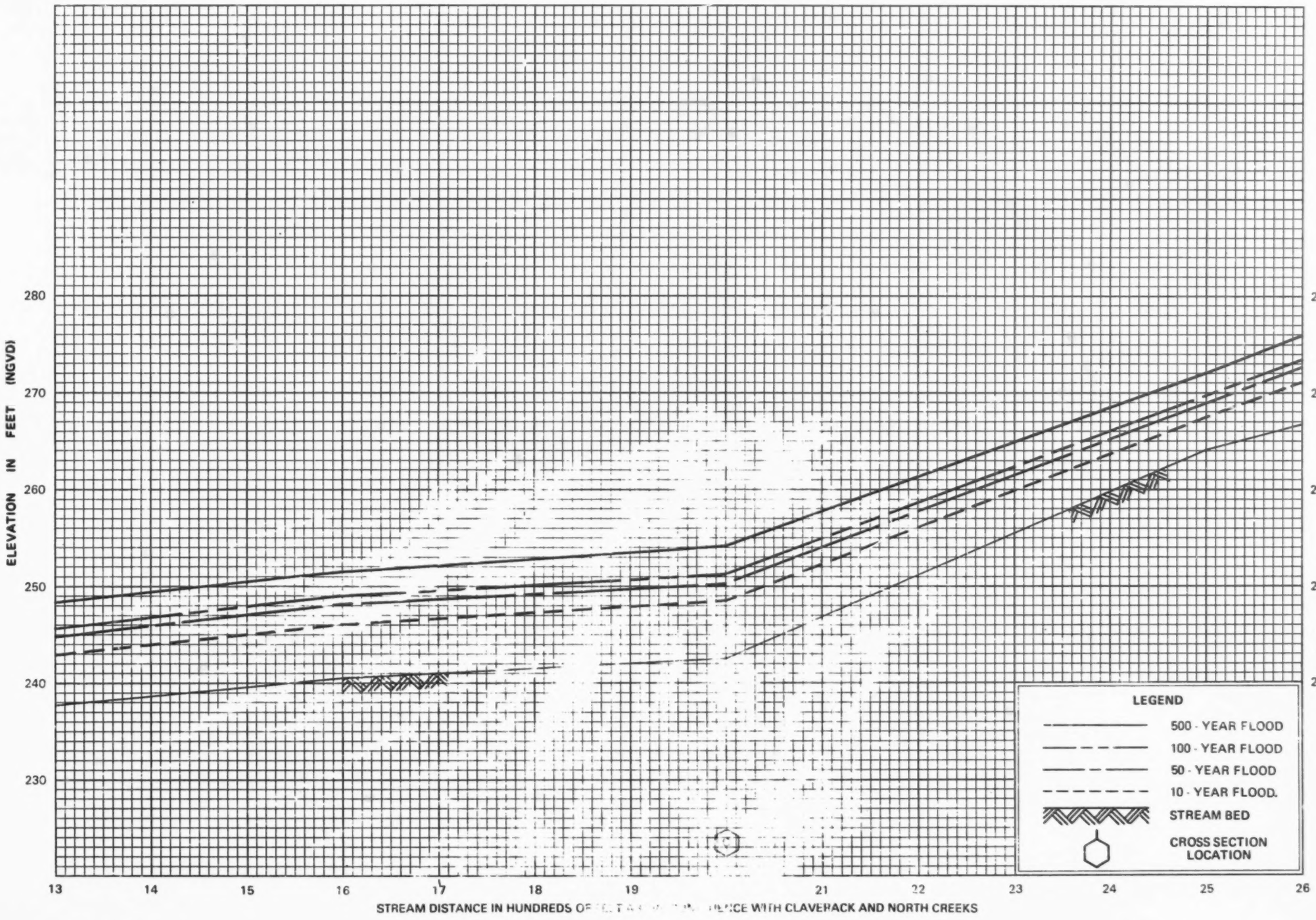
## AGAWAMUCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLAVERACK, NY

(COLUMBIA CO.)

01P




FLOOD PROFILES

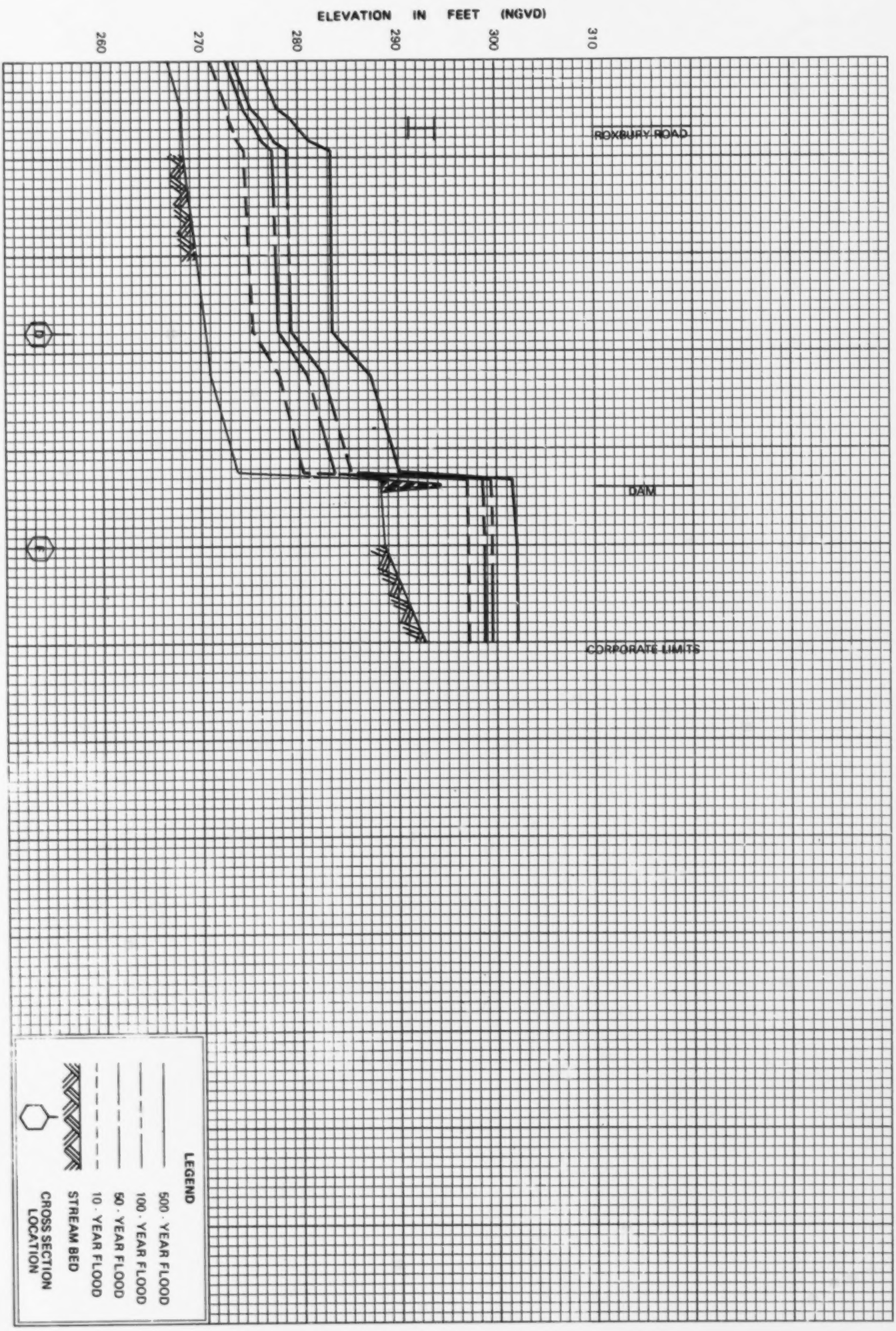
AGAWAMUCK CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLAVERACK, NY

(COLUMBIA CO.)

02P




03P

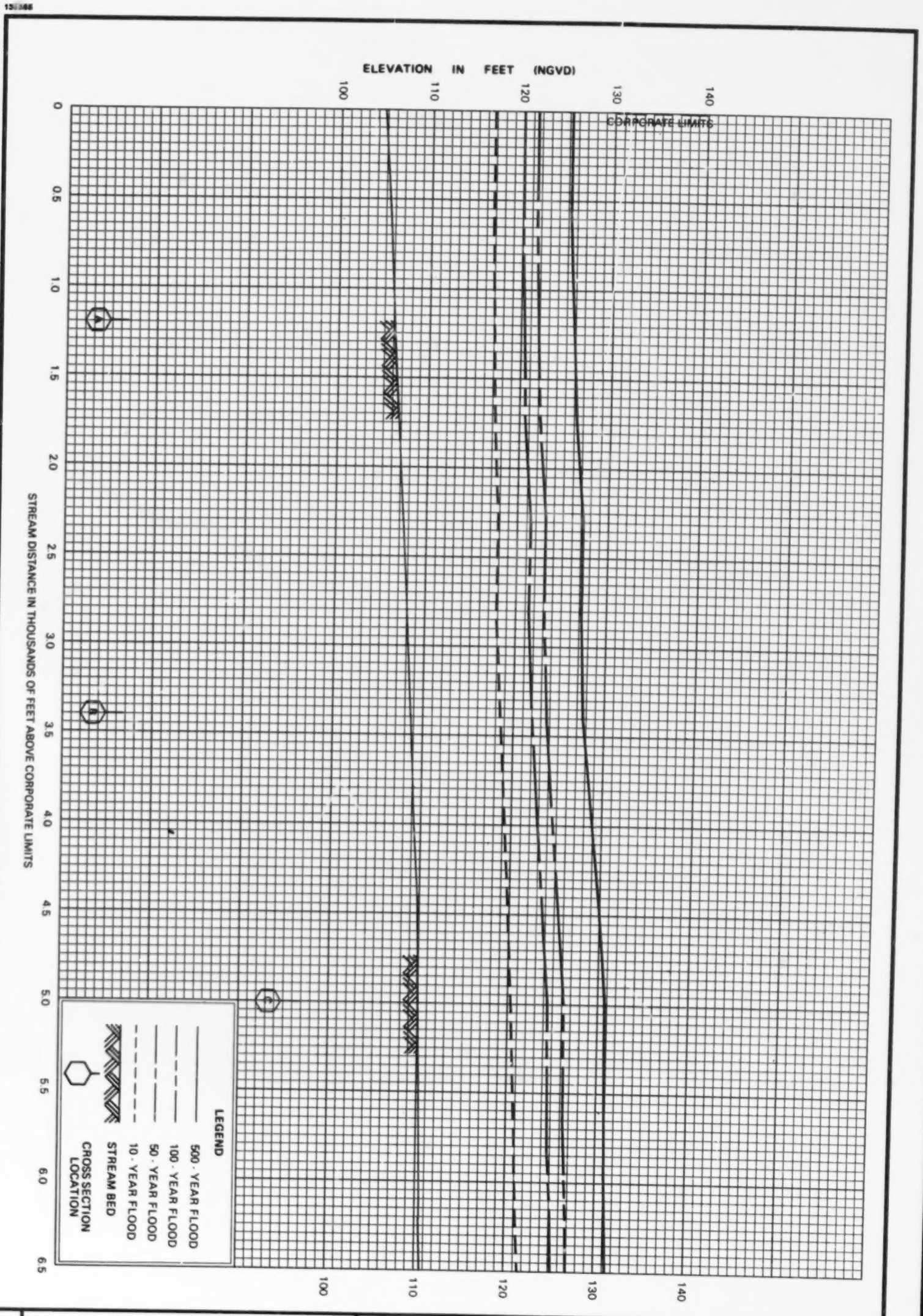
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLAVERACK, NY

(COLUMBIA CO.)

FLOOD PROFILES

AGAWAMUCK CREEK




04P

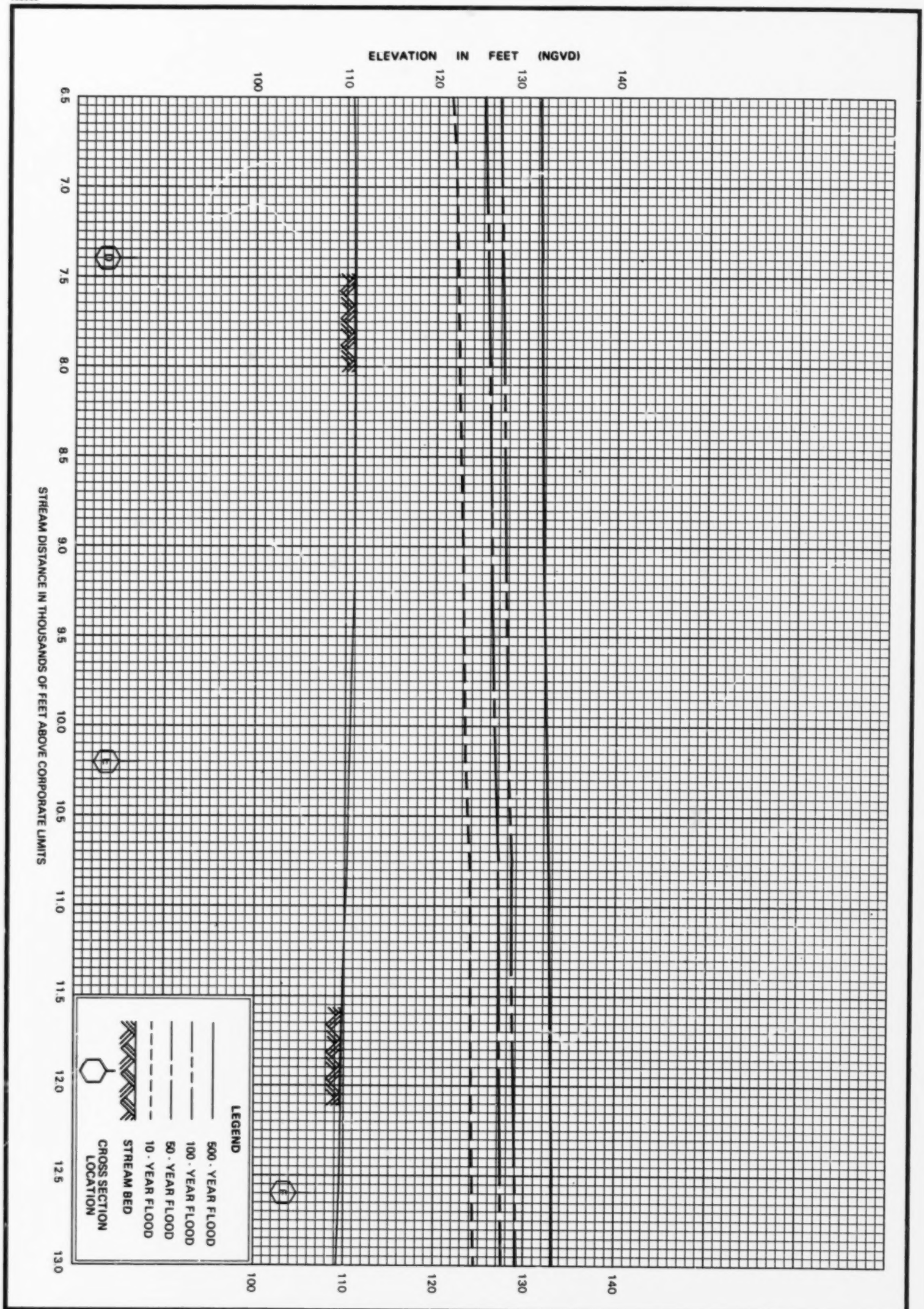
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLAVERACK, NY

(COLUMBIA CO.)

FLOOD PROFILES

CLAVERACK CREEK (LOWER REACH)




05P

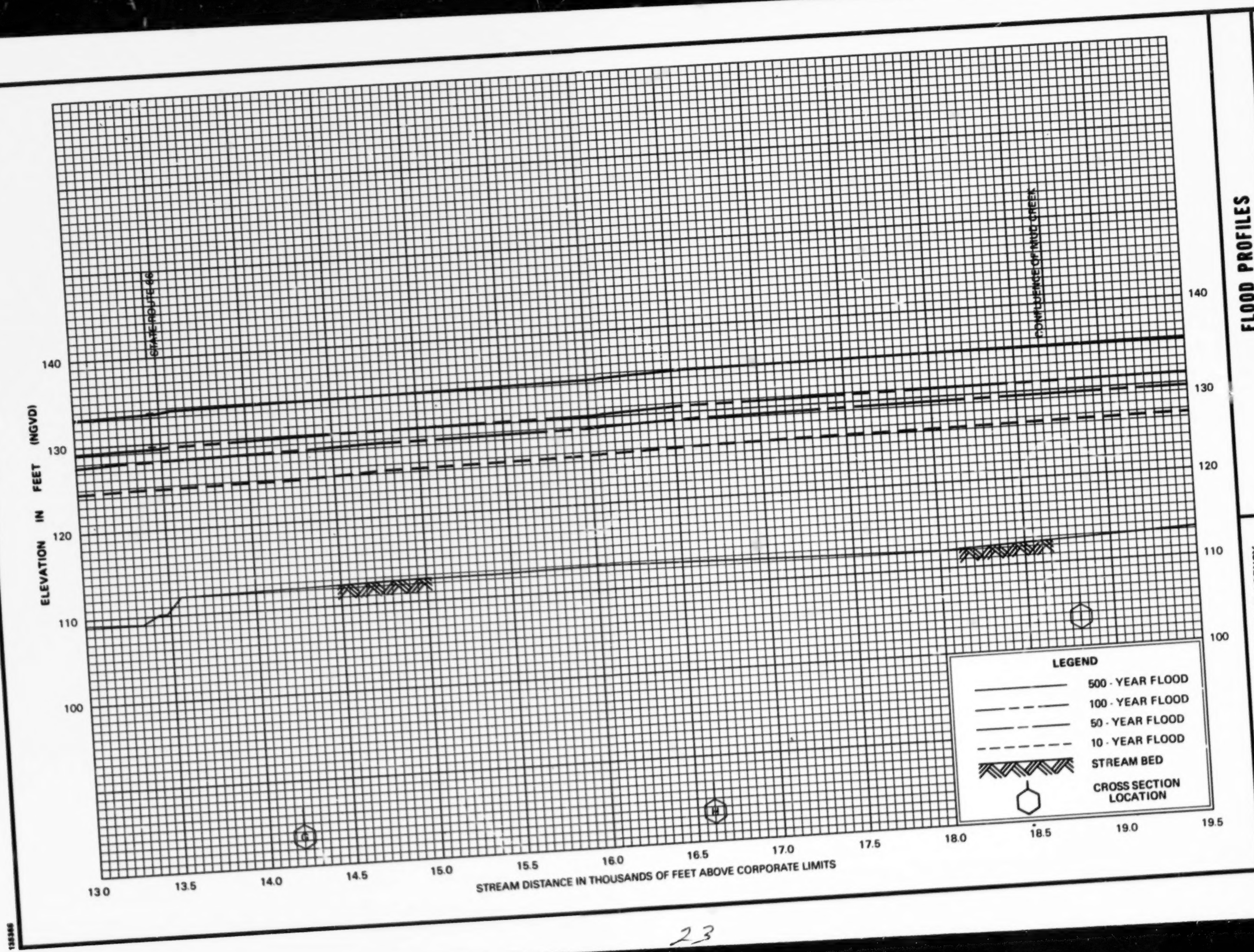
FEDERAL EMERGENCY MANAGEMENT AGENCY

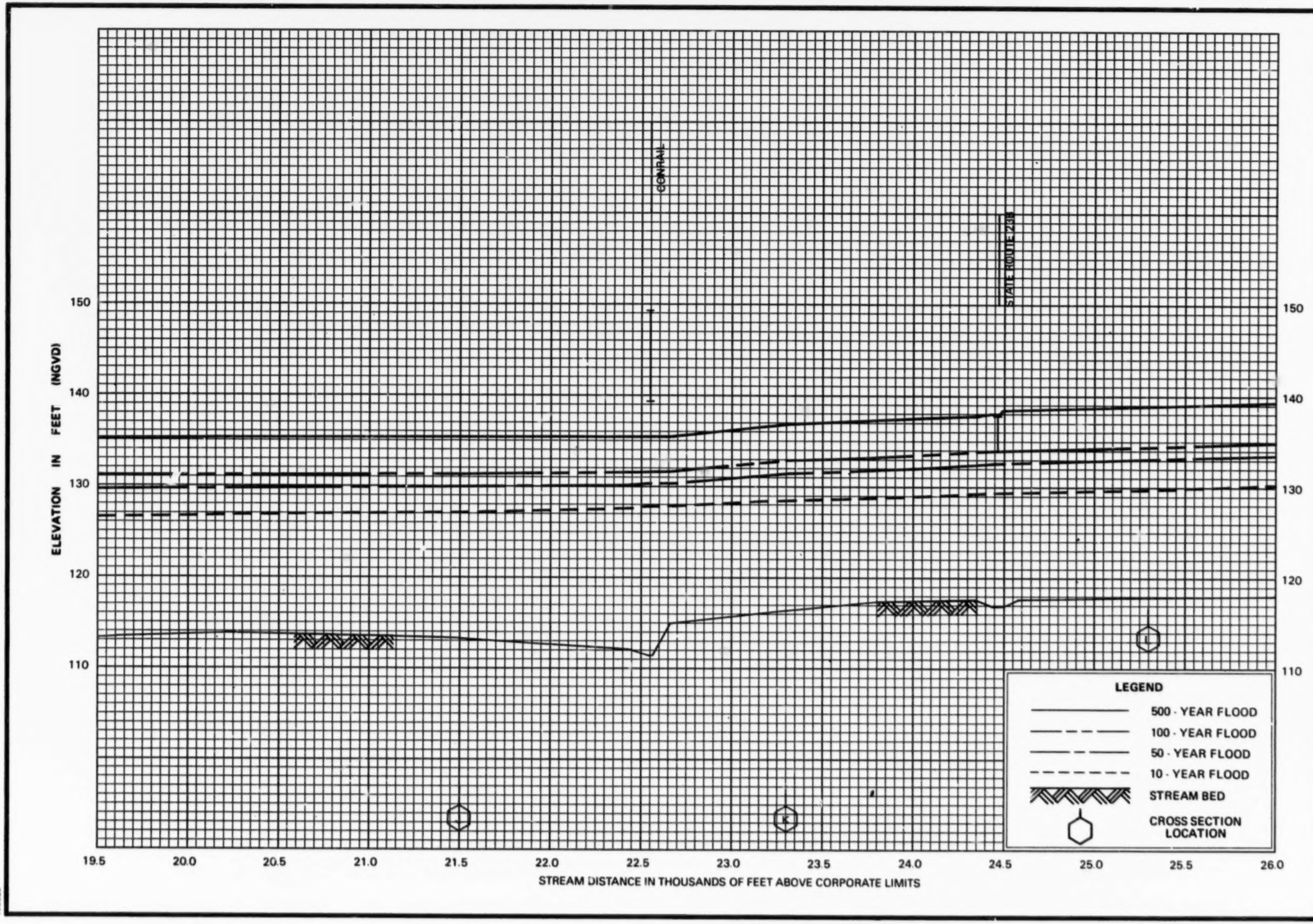
TOWN OF CLAVERACK, NY

(COLUMBIA CO.)

FLOOD PROFILES

CLAVERACK CREEK (LOWER REACH)


ELEVATION IN FEET (NGVD)
140
130
120
110
100
140
130
120
110
100
STATE ROUTE 66
CONFLUENCE OF MUD CREEK
LEGEND
500 - YEAR FLOOD
100 - YEAR FLOOD
50 - YEAR FLOOD
10 - YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CORPORATE LIMITS
FLOOD PROFILES
CLAVERACK CREEK (LOWER REACH)
FEDERAL EMERGENCY MANAGEMENT AGENCY
TOWN OF CLAVERACK, NY
(COLUMBIA CO.)
06P



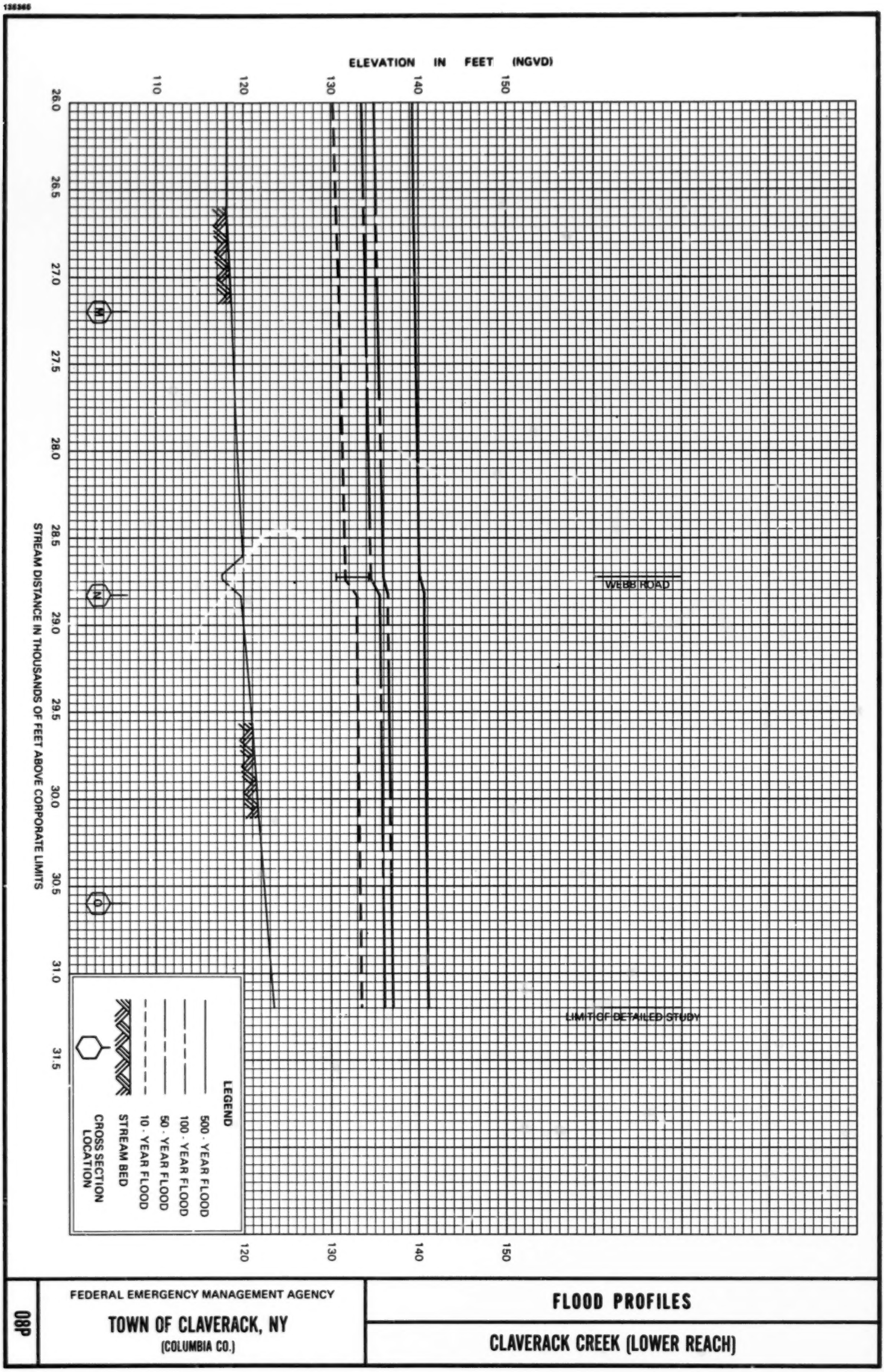

FLOOD PROFILES

CLAVERACK CREEK (LOWER REACH)

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLAVERACK, NY
(COLUMBIA CO.)

07P




FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF CLAVERACK, NY**

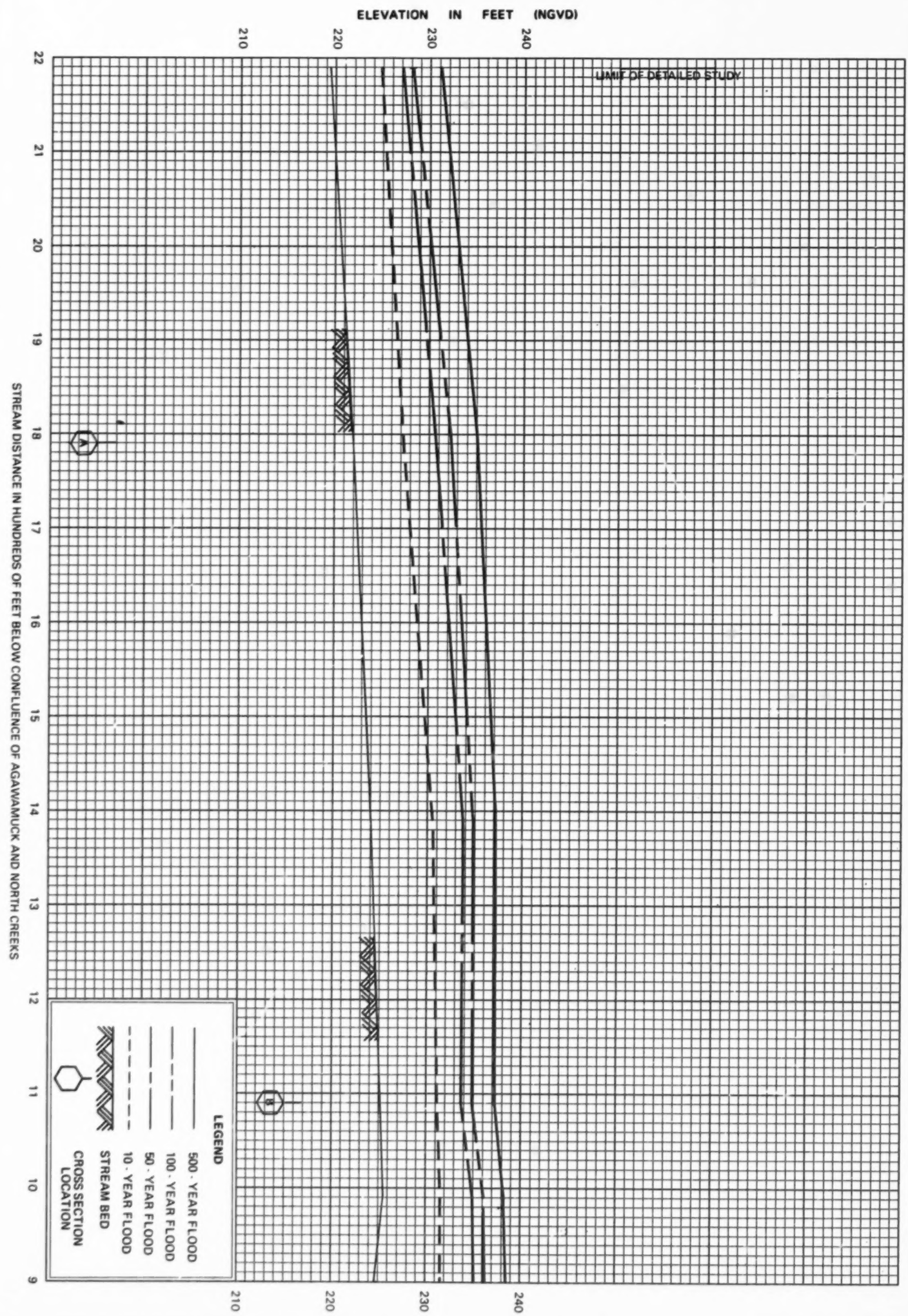
(COLUMBIA CO.)

**FLOOD PROFILES**

**CLAVERACK CREEK (LOWER REACH)**

08P

138368




09P

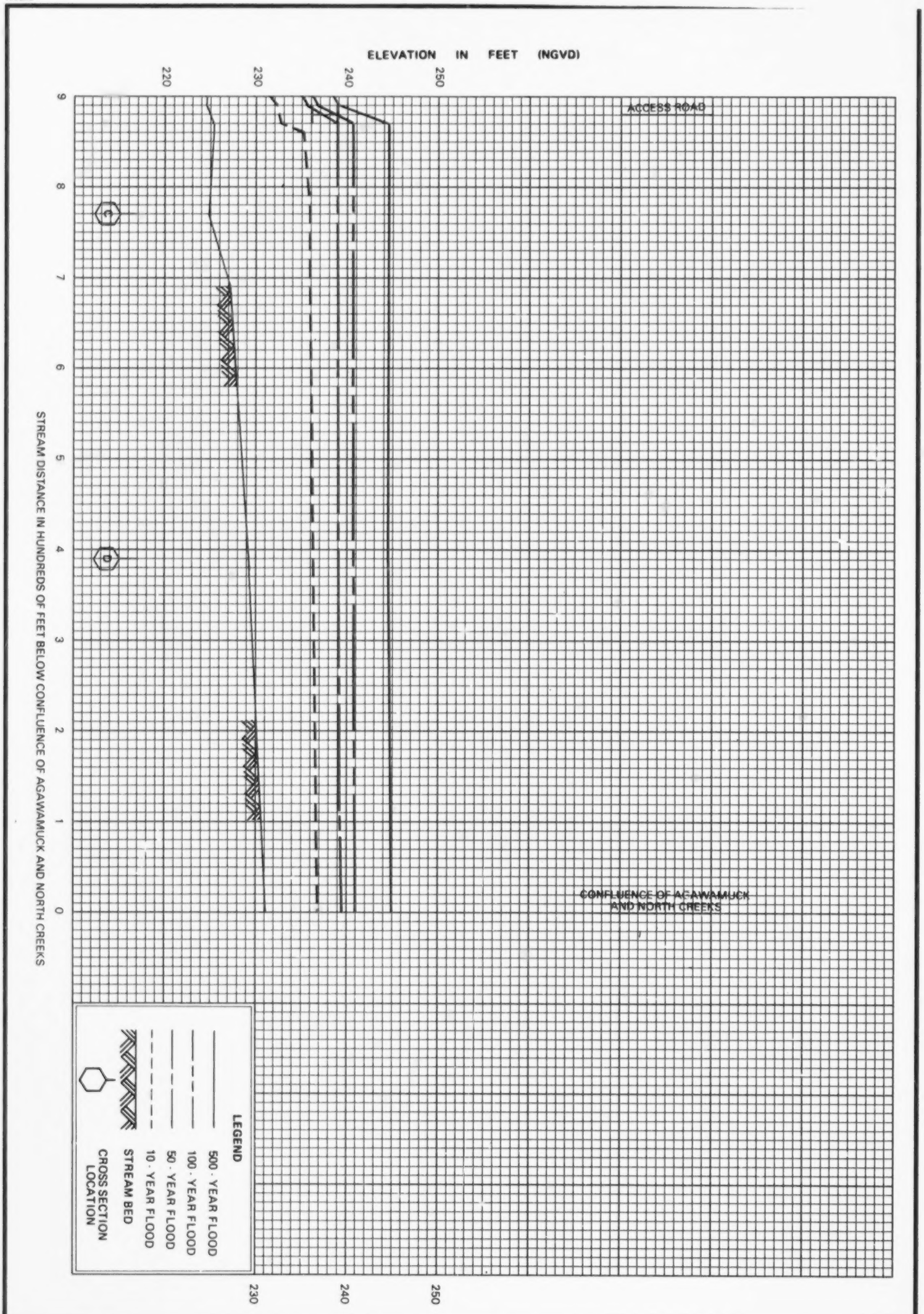
FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF CLAVERACK, NY**

(COLUMBIA CO.)

**FLOOD PROFILES**

**CLAVERACK CREEK (UPPER REACH)**




10P

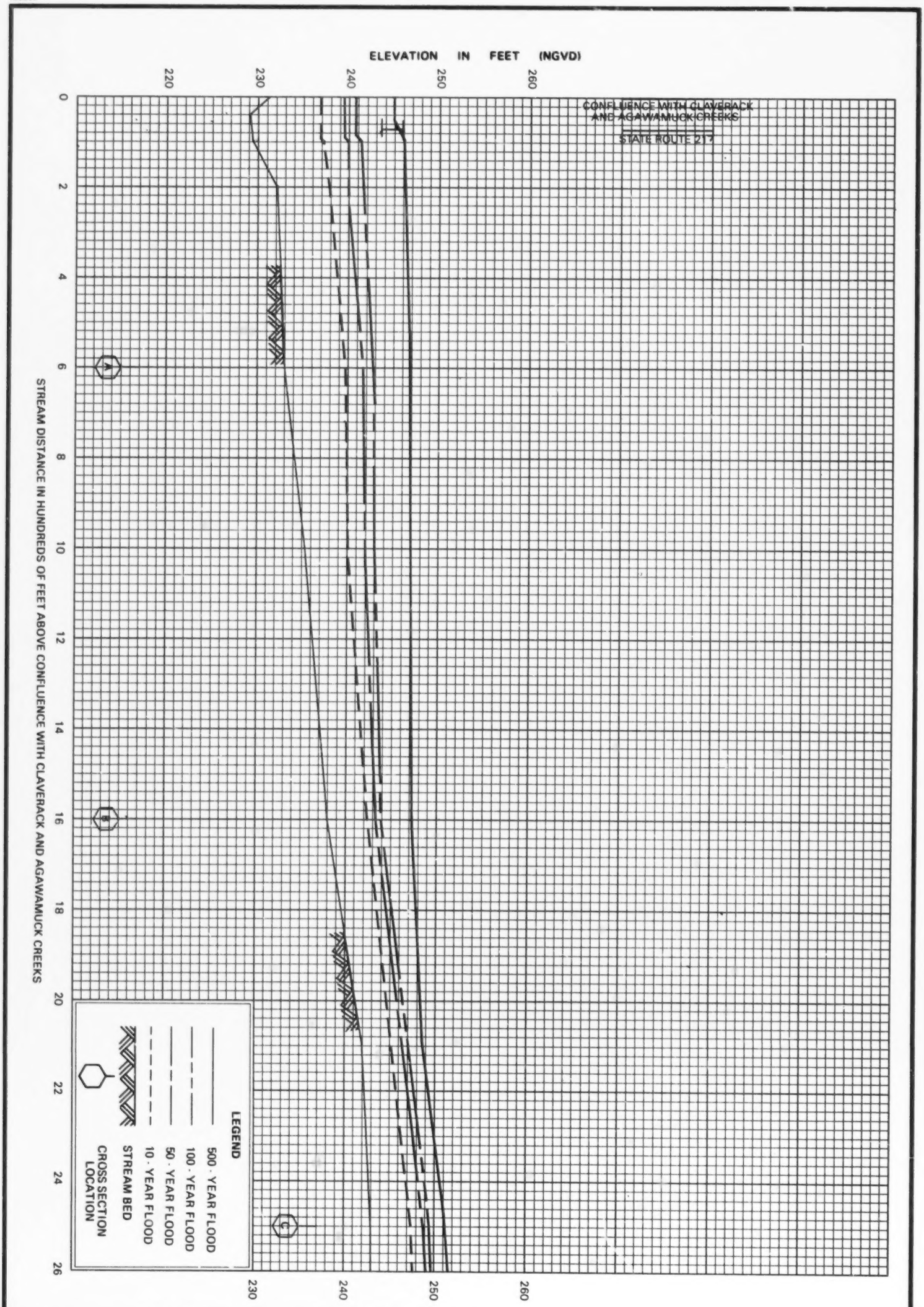
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF CLAVERACK, NY

(COLUMBIA CO.)

FLOOD PROFILES

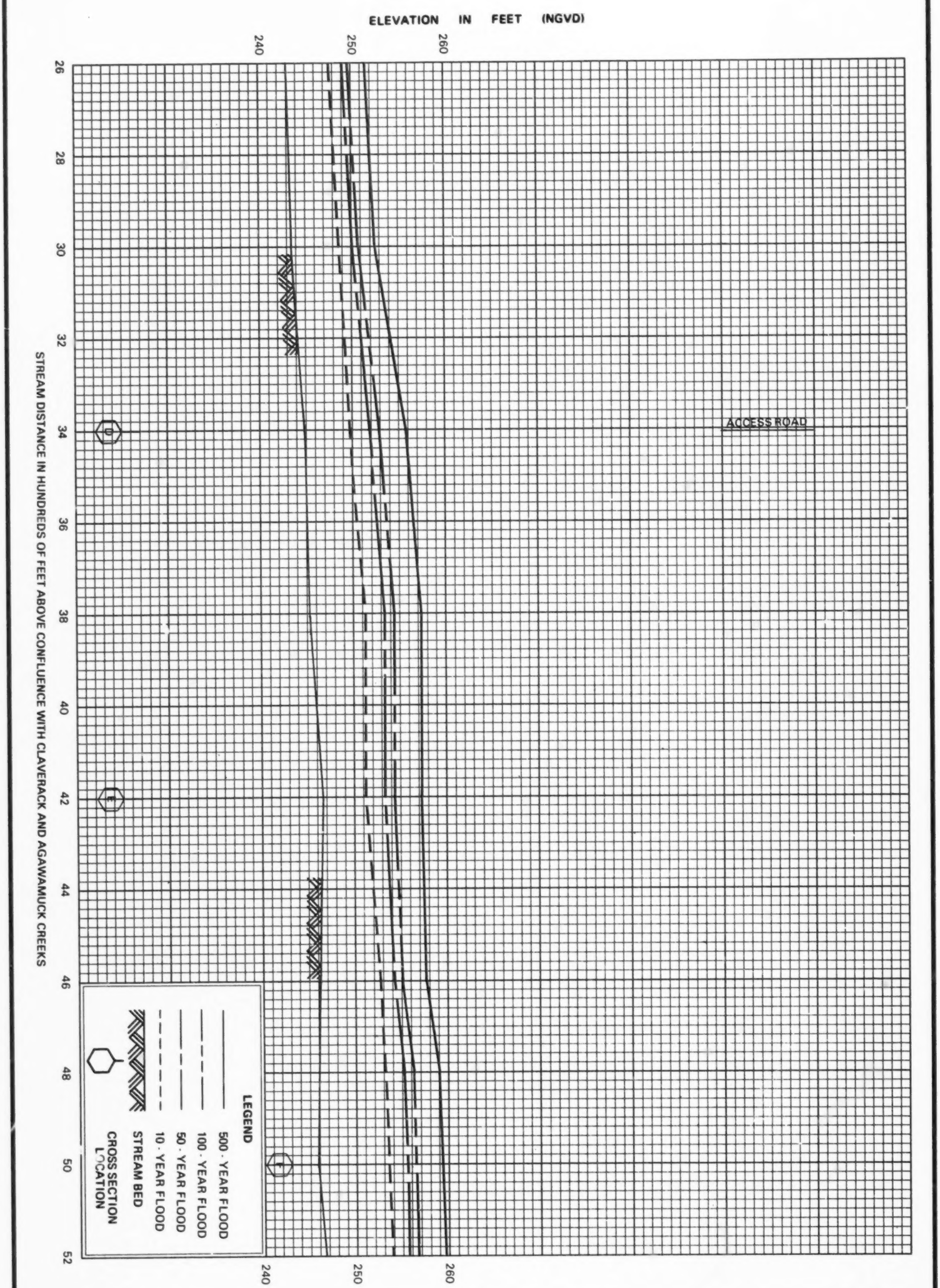
CLAVERACK CREEK (UPPER REACH)




28

| | | |
|---|---|---|
| 11P | FEDERAL EMERGENCY MANAGEMENT AGENCY<br>**TOWN OF CLAVERACK, NY**<br>(COLUMBIA CO.) | **FLOOD PROFILES**<br>**NORTH CREEK** |

135365




29

12P

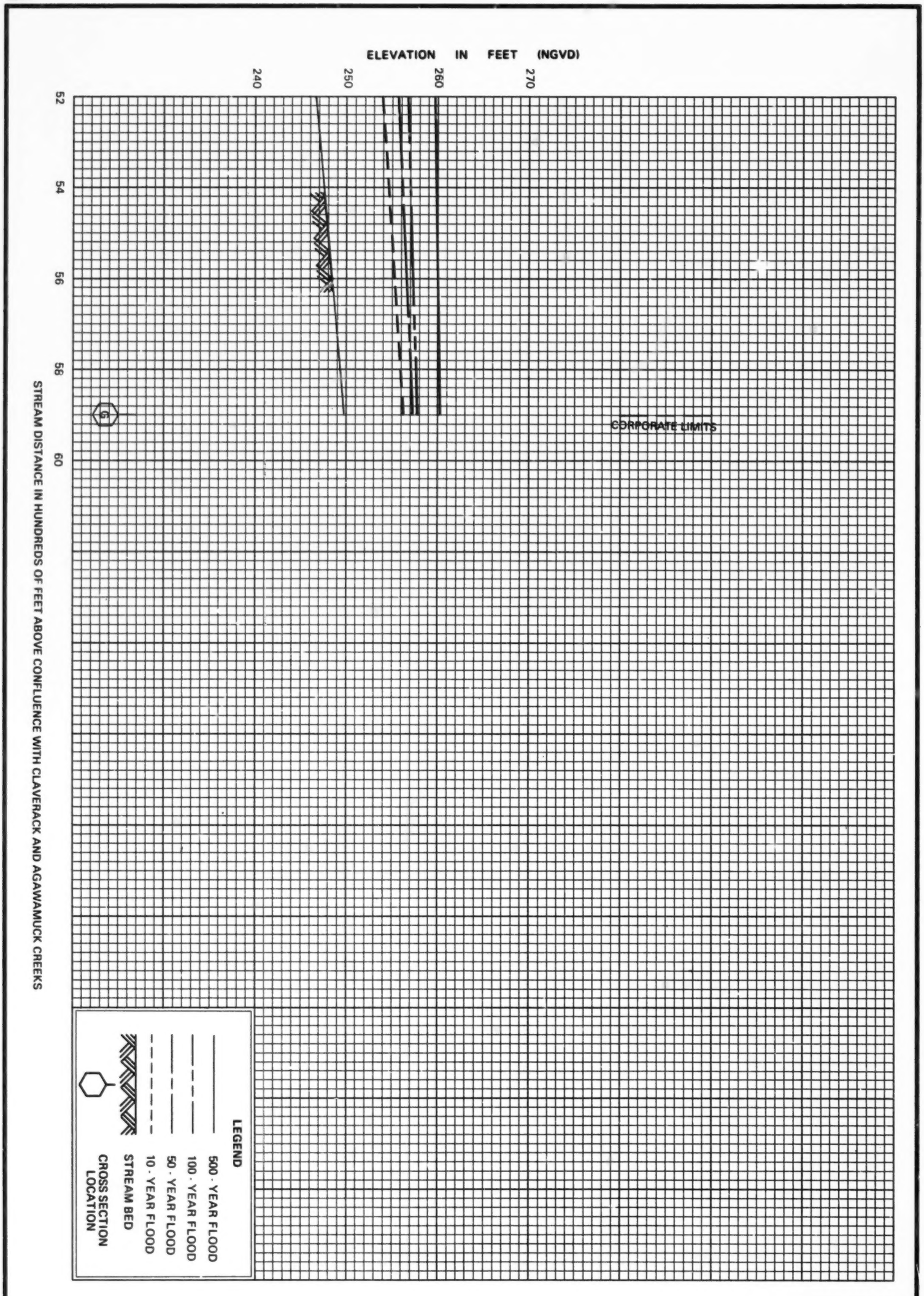
FEDERAL EMERGENCY MANAGEMENT AGENCY

**TOWN OF CLAVERACK, NY**

(COLUMBIA CO.)

**FLOOD PROFILES**

**NORTH CREEK**




30

| 13P | FEDERAL EMERGENCY MANAGEMENT AGENCY<br>**TOWN OF CLAVERACK, NY**<br>(COLUMBIA CO.) | **FLOOD PROFILES**<br>**NORTH CREEK** |
|---|---|---|